Session 2 - Practice Calcium Linescan (synthetic)
Working with AI: Image Analysis using LLMs - UC Davis School of Medicine

FILE: Session2_Practice_Linescan.tif
FORMAT: 16-bit grayscale TIFF, uncompressed, 256 rows (space) x 750 columns (time)

>>> THIS IS NOT THE RECORDING FROM THE SESSION. <<<
    Different content on purpose, so you cannot pattern-match the picture you
    watched being built: this one has 5 sparks, 2 whole-cell transients, and NO
    wave. The class recording had 3 sparks, 1 transient and 1 wave. Geometry and
    kinetics are identical, so a tool built from the session prompts runs on it
    unchanged - it just has to find different things.

ACQUISITION (simulated confocal line-scan)
  Line rate: 500 lines/second
  Time per column: 2 ms
  Total duration: 1.5 s (750 columns)
  Spatial calibration: 0.30 um/pixel
  Scanned line length: 76.8 um (256 pixels)
  Indicator: Fluo-4 (single-wavelength), raw fluorescence F
  Baseline F0:   ~1000 counts (arbitrary units)

AXES
  Y (rows)   = space along the scanned line
  X (columns) = time

CONTENTS (exact positions in Session2_Practice_Linescan_GroundTruth.csv)
  5 calcium sparks   - local, brief: 10 ms rise, ~20 ms decay tau, ~1.8 um sigma
  2 whole-cell transients - global, slower: 40 ms rise, ~60 ms decay tau,
                            1100 ms apart (~0.9 Hz pacing)
  NO propagating wave   - a correct detector reports none. If yours finds one,
                            that is a false positive, and worth understanding.
  + planted distractor artifacts (4 brief flickers, 3 narrow streaks) that a naive
    detector will falsely flag. These are NOT real events; they exist so each
    detection gate (amplitude / duration / width) has a distinct job.

  Spark kinetics sit just inside the published reference band:

SparkMaster 2
  (Tomek, Nieves-Cintron, Navedo, Ko & Bers, Circulation Research 2023;133(6):450-462)
  reports spark TTP ~15 ms and decay tau ~20 ms. These sparks are slightly faster
  than that typical value, which is why they carry the tightest Nyquist margin of
  anything in the recording (~5-6x) - still comfortably resolved at 500 lines/s.

USE
  Compute delta-F/F0 with F0 taken from the first 100 ms (first 50 columns, before
  any event and clear of every planted artifact), per row. delta-F/F0 is
  scale-invariant, so the raw count scaling above does not matter.

  Pixel values are raw fluorescence counts in the high hundreds to low thousands -
  they are NOT 0-255. Do not assume 8-bit.

  Part A target: recover the spark peak times, then compute the intervals between
  consecutive sparks. Check them against the ground-truth key only afterwards.